

**A Ball State University Center for the Environment**

An Architectural and Honors Thesis (ARCH 401/ HONRS 499)

by

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Thesis Advisor  
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A handwritten signature in black ink, appearing to read 'Michele Chiuini', with a large, stylized initial 'M'.

Ball State University  
Muncie, Indiana

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### Abstract:

With rising demands for ecologically friendly architecture and sustainable design solutions, the Ball State department of Architecture fourth year undergraduate capstone assignment was to design a Ball State University Center for the Environment. This was to be a comprehensive project involving all of the knowledge of our undergraduate career. It was also to be a design competition sponsored by CRIPE Architects + Engineers. The building site was located on Ball State's campus between the existing Teacher's College building and the Arts and Journalism Building. Trying to fit into the existing context and continue the internal "street" of the connecting buildings on campus, the challenge was to create an icon of sustainability for an ever-greening campus. The building was not only to showcase sustainability in its architecture and mechanics, but also in its function. It would become a laboratory and lecture hall location on campus as well as showcasing sustainability in exhibit halls and a state of the art natural water treatment facility. With the help of my professor and advisor Michele Chiuini, I was able to design this project. I have provided a brief analysis of the project requirements and my design solution as well as drawings and images showcasing the project's process and final design.

### Acknowledgements:

\_ I would like to thank CRIPE Architects + Engineers for sponsoring this competition and providing the opportunity for me to display the capstone of my architectural education.

\_ I would also like to thank my professor and advisor Michele Chiuini for his faithful commitment to my project and progress in architecture.

## A Ball State University Center for the Environment

The world is rapidly changing with the increases in technology, population, and information. Technology seems to ease life's problems, but it also makes life more complicated. This has been the consistent trend throughout the history of the world, and this constant advancement in technology has appeared to take an effect on our planet. Experts throughout the world are now saying that if our current trends continue the earth will not be able to sustain itself. The world is now heavily concerned with green everything and sustainable solutions.

Architecture is not excluded from this green craze but is in fact leading the charge. All around the world architects and their clients are taking the problem seriously and realizing that buildings cause most of the damage. This does not cause them to feel discouraged but hopeful that they can then help buildings have the most positive impact. Sustainable architecture is becoming a widespread term and simply means architecture that will sustain itself over time: ecologically, economically, socially, culturally and so on. This is one response to the environmental challenges we face today. Another is regenerative design, which looks to actually generate energy and have a positive impact on the surrounding environment. These ways of thinking will dominate the landscape of architectural thought throughout the next century and perhaps beyond that.

With all of this in mind, we embarked on our final capstone project for the undergraduate degree in architecture. The project was a design competition sponsored by CRIPE Architects + Engineers out of Indianapolis, IN. The design problem was to create a Ball State Center for the Environment on the campus of Ball State University. Our site

was located between the existing Teacher's College building and the Arts and Journalism Building. As all of the buildings on that particular side of McKinley Ave are connected internally, our new building would act as a bridge connecting Teacher's College to the Arts and Journalism Building, completing the interior street. The center would house classrooms, a lecture hall, exhibit space, lab spaces, offices, and a solar aquatic machine for managing wastewater. The idea of the building was to create both an icon for sustainable architecture and a building to learn about sustainability. The program presented the unique challenge of both unifying the campus and standing out as an icon. It also emphasized a command of technology and sustainable design moves in order to create a comprehensive building design and meet the needed space requirements.

Presenting a great deal of challenges our site began to cause problems early. We were required to maintain the existing parking lot, forcing our site to be long, narrow, and oriented north to south. This made utilizing the sun and being able to control the heat gain and loss difficult. It also forced us to deal with the large shadows created by Teacher's college over the site. Needing a great deal of sunlight, the solar aquatic machine was difficult to place on the site. This was one of the controlling factors in the final solution.

The main concept of my design solution was that of a bridge. Bridges are used to make connections. This building was all about connections. It was making physical connections with two existing buildings. It was making visual connections with the entire campus. And it was making the connection between the existing campus and a step into the future in making the campus more sustainable. This means the entire building is about being a literal and figurative bridge.

As we began to work on this project it became evident that we needed to do first-hand research of laboratory spaces. Therefore we did a precedent study of labs and investigated the labs on campus in the Cooper Science building. In that I discovered what labs need to be effective and that flexibility is a great benefit. This led me to use a structural system that would allow for the maximum flexibility over time. To do this I used a super structure of large steel trusses that stood on columns above the building. The floors of the building were then suspended off of these structures, leaving them hanging. I pursued this design and came up with a preliminary building design. These drawings are represented in the first six pages of the attached drawings. To begin emphasizing the bridge concept the building was elevated off the first floor with an almost completely glass corridor only on the first floor. This showcased the idea of a bridge. The design proposal utilized several green technologies, including wind turbines, green roofs, and daylighting strategies.

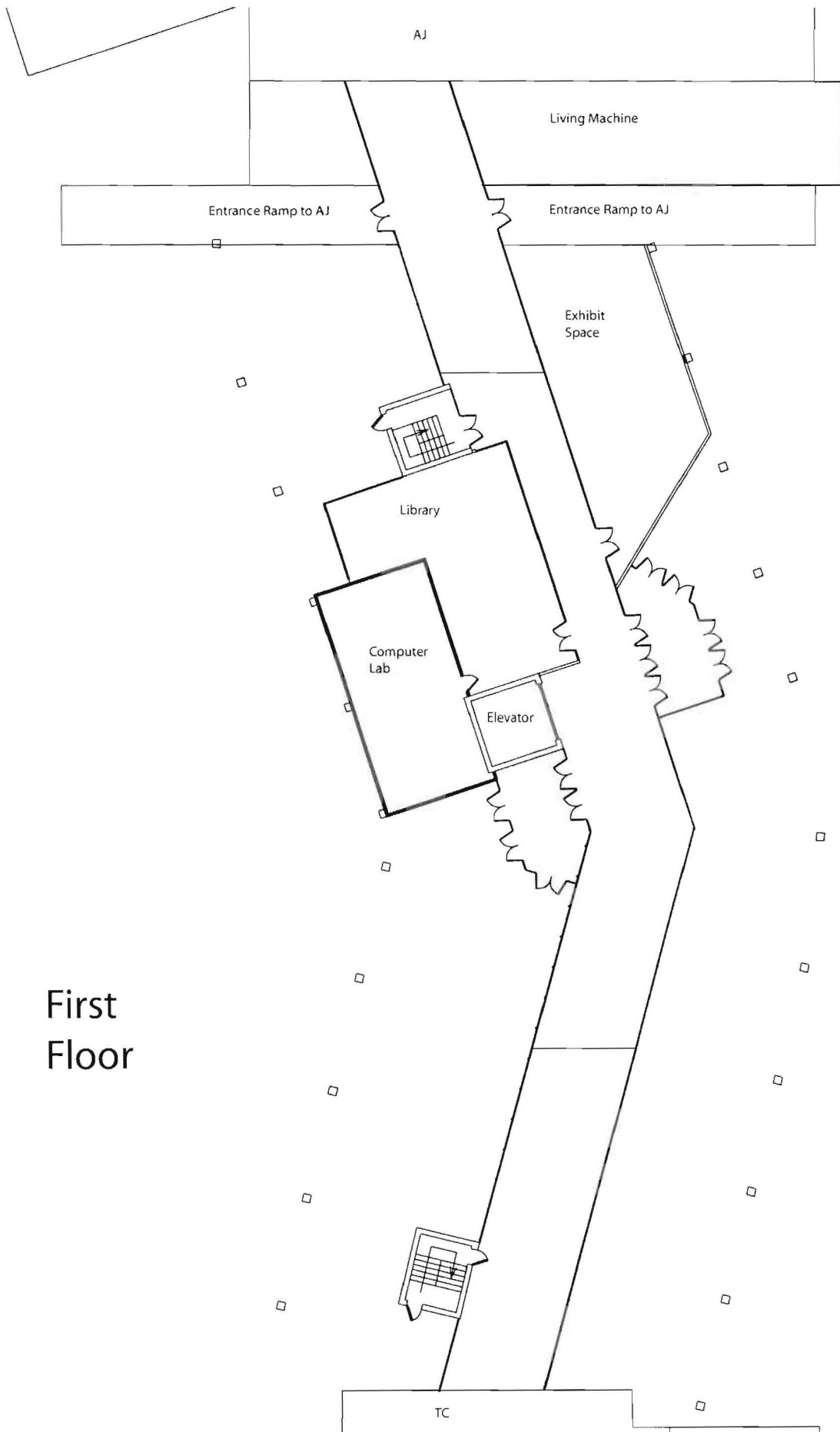
As I transitioned into the final design, I kept many of the concepts of the original but altered some of the specific ways in which these concepts were applied. The first of these was the structure. I kept the idea of the suspended structure, but I reduced the amount of structural trusses and turned them to run on axis with the building. This made the trusses deeper as they were carrying more load, but it emphasized the bridge feeling of the building and allowed for the placement of wind turbines within the structural trusses. I also modified the floor plans in order to emphasize the flexibility of the building over time. This was a great advantage to the design, seeing as it was on a university campus, which is ever changing, and it is a building that is dependent upon technology that is also ever changing. With these ideas in mind I used a simple but

strong geometry that was repeated. It allowed for flexibility but let the building stand out as an icon of sustainable architecture.

To fulfill the design requirements and make a comprehensive project, I had to look at the details and construction of the building. This was accomplished with detail drawings, a wall section, and several conversations with my professor over the practical applications of my structural solution. This also included adherence to codes, and thorough attention paid to the special layout. In the midst of that, I attempted to create compelling images that showcased the project as an icon in sustainable architecture, giving Ball State a useful recruiting tool for prospective faculty and students.

Overall this project was very challenging, exciting, and stretching. To attempt to fit all of my architectural education into one semester long project is quite a task, but I believe that the project does showcase my education well. Through the project I learned a great deal about how architectural theories, concepts, and strategies get played out in actual buildings. I also learned how extensive the design process is, and how rewarding it can be at times. It was a project to be remembered and a learning process that still has not ended.

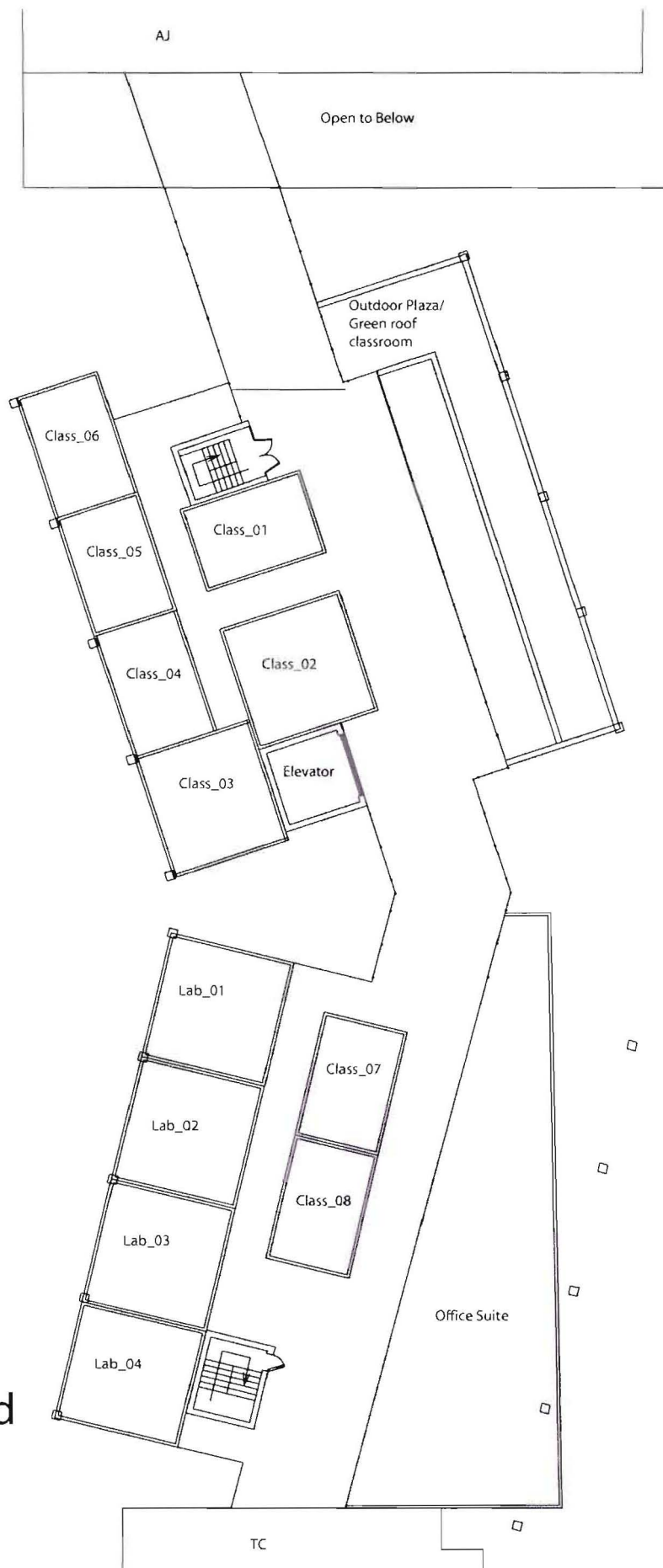




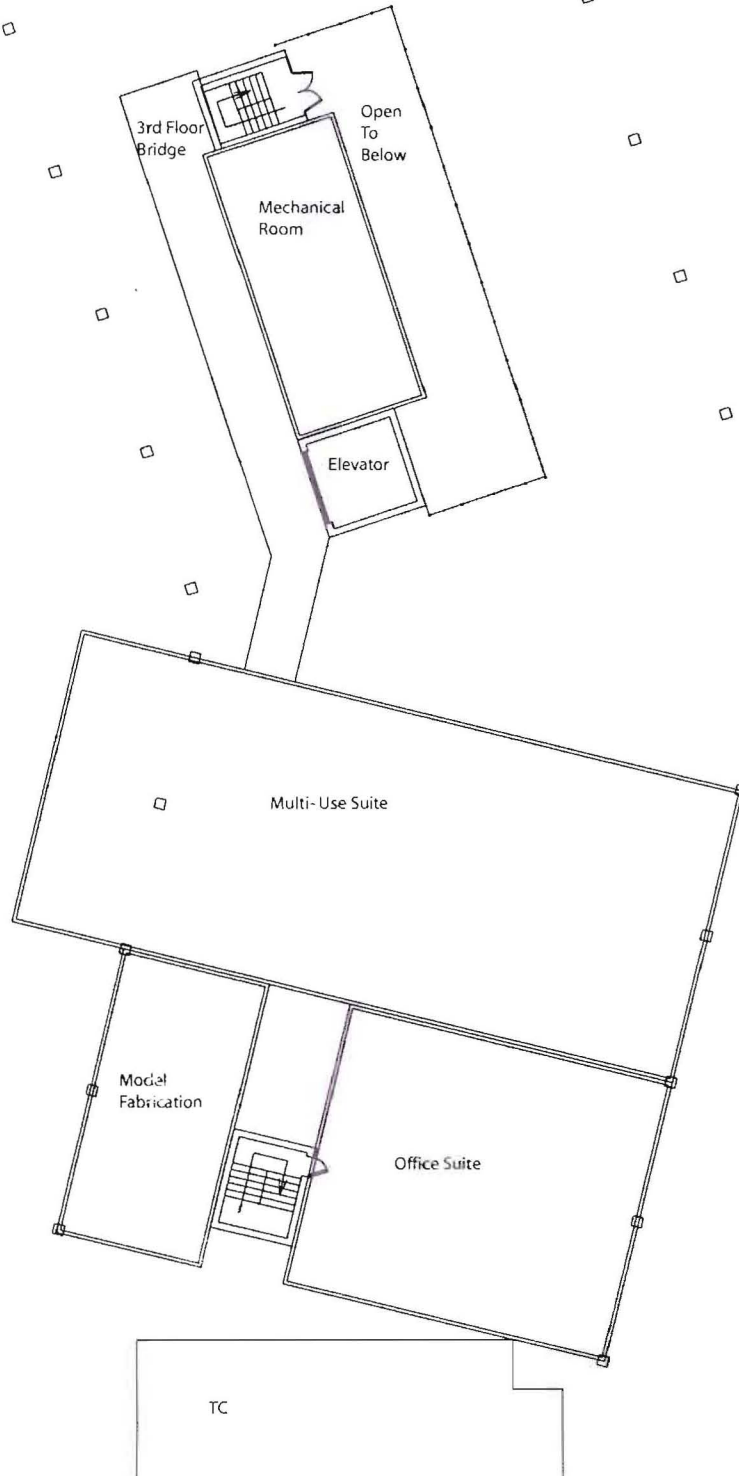
First  
Floor

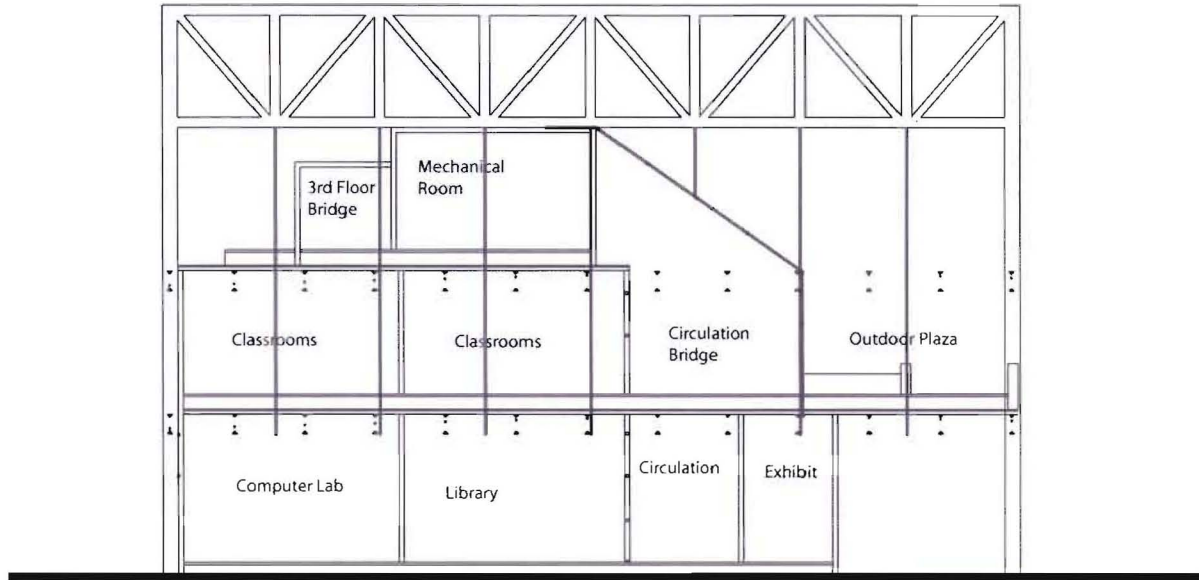


Second Floor

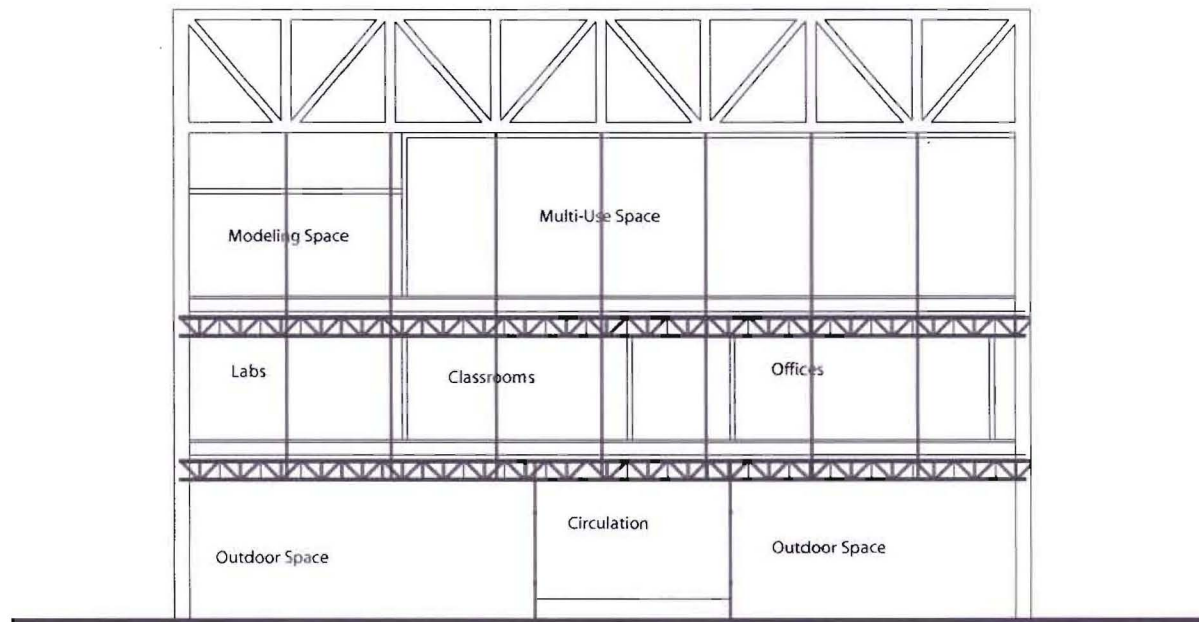


# Third Floor

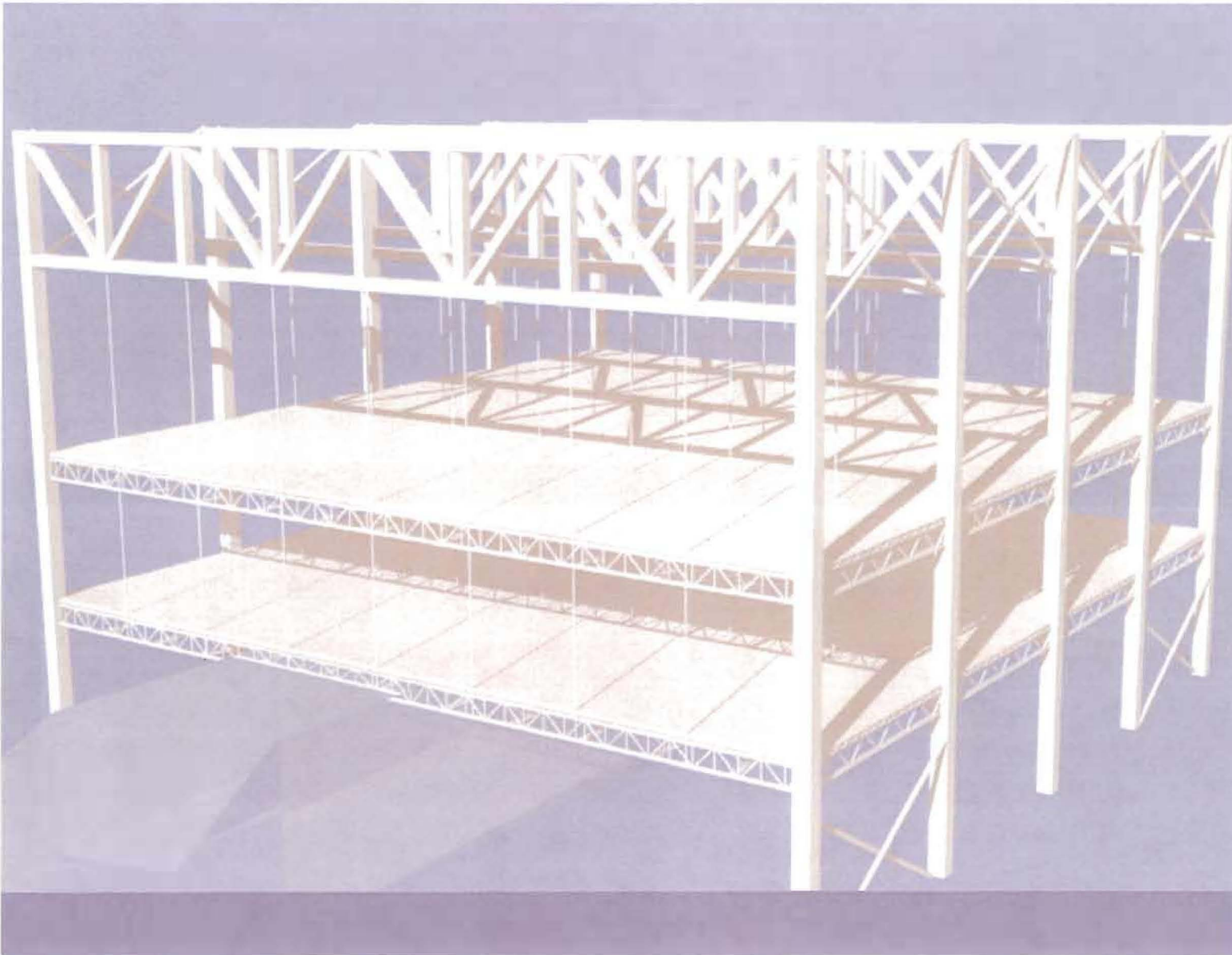




Section Through Building\_01 from North East to South West



Section Through Building\_02 from North East to South West



## Structural System

\_12' deep Trusses above the building

\_Tie Rods holding the hanging Floors

\_2' deep floor system

\_Allows for Flexible partition design

\_Allows free elevation design to maximize daylighting

\_Creates visual Iconic value for the building

\_Allows future adaptation to the floor plan and room arrangement

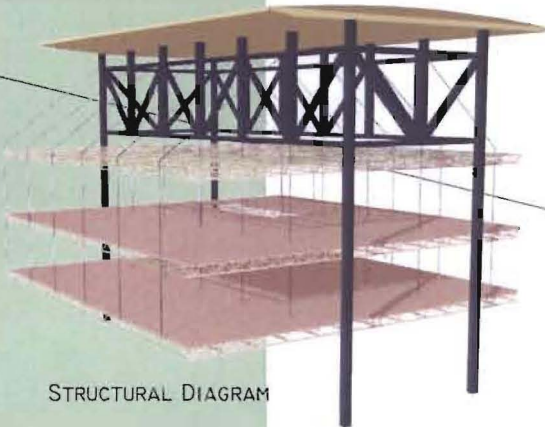


# A BALL STATE UNIVERSITY CENTER FOR THE ENVIRONMENT

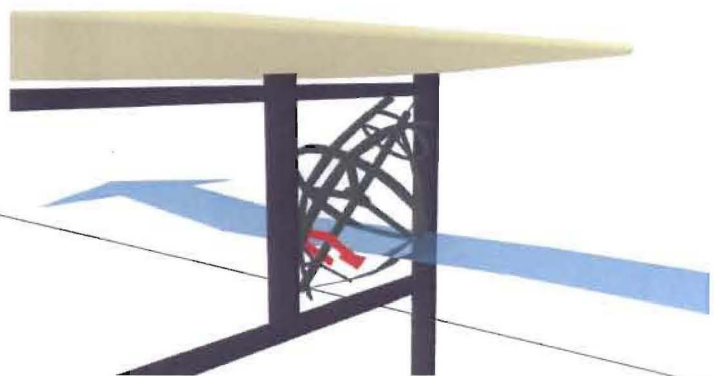
A DESIGN COMPETITION SPONSORED AND FUNDED BY CRIPE ARCHITECTS + ENGINEERS



BRIDGES ARE USED TO CONNECT TWO DESTINATIONS. THE BALL STATE CENTER FOR THE ENVIRONMENT WILL NOT ONLY CONNECT TWO BUILDINGS, BUT IT WILL HELP BRIDGE THE SUSTAINABILITY GAP BY MOVING BALL STATE ARCHITECTURE IN A NEW DIRECTION. WITH ICONIC WIND TURBINES AND STRUCTURAL ELEMENTS, THE BUILDING ATTRACTS ATTENTION AND PRODUCES ENERGY, AND EDUCATION.



STRUCTURAL DIAGRAM



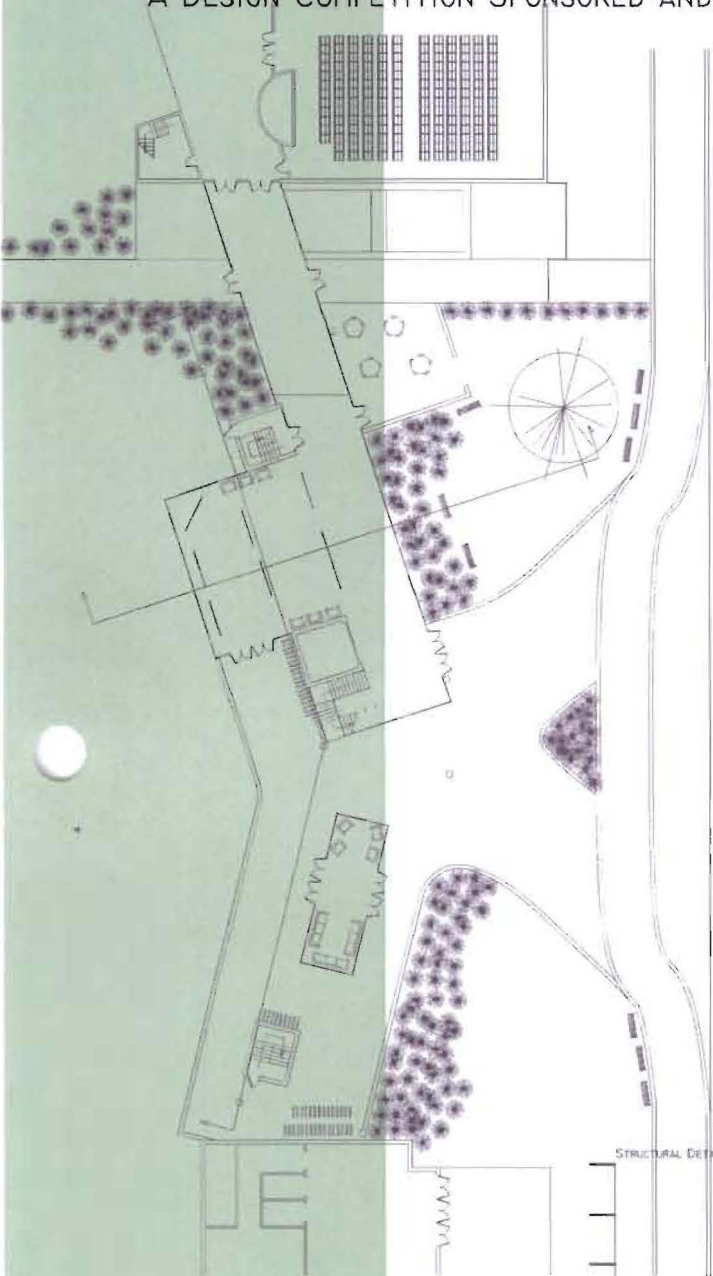
WIND TURBINE DIAGRAM



EXTERIOR VIEW FROM MCKINLEY — B

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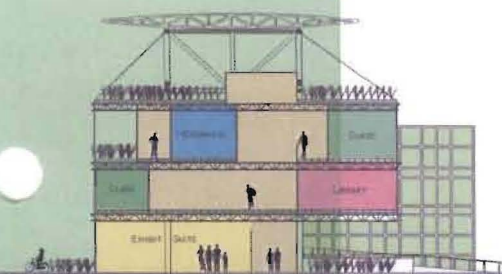


STRUCTURAL DETAIL

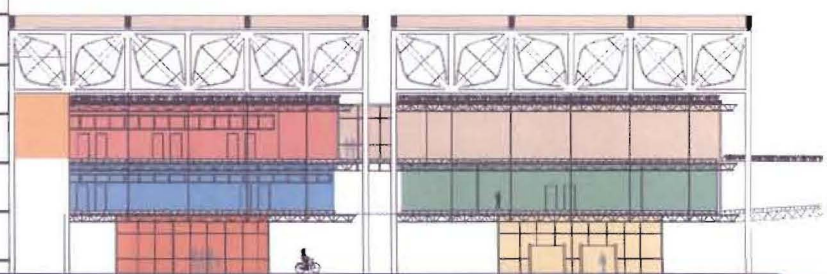


FACADE

ELEVATION NORTH-SOUTH



SECTION\_01 EAST-WEST

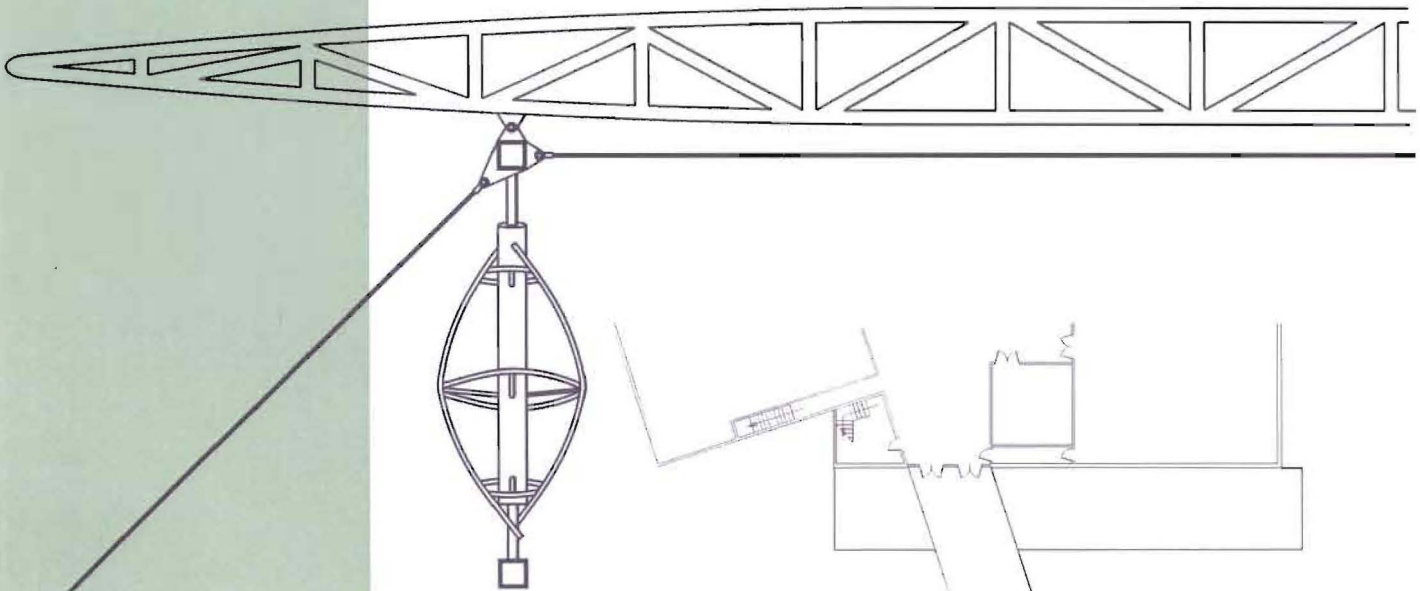


SECTION\_02 NORTH-SOUTH



# A BALL STATE UNIVERSITY CENTER FOR THE ENVIRONMENT

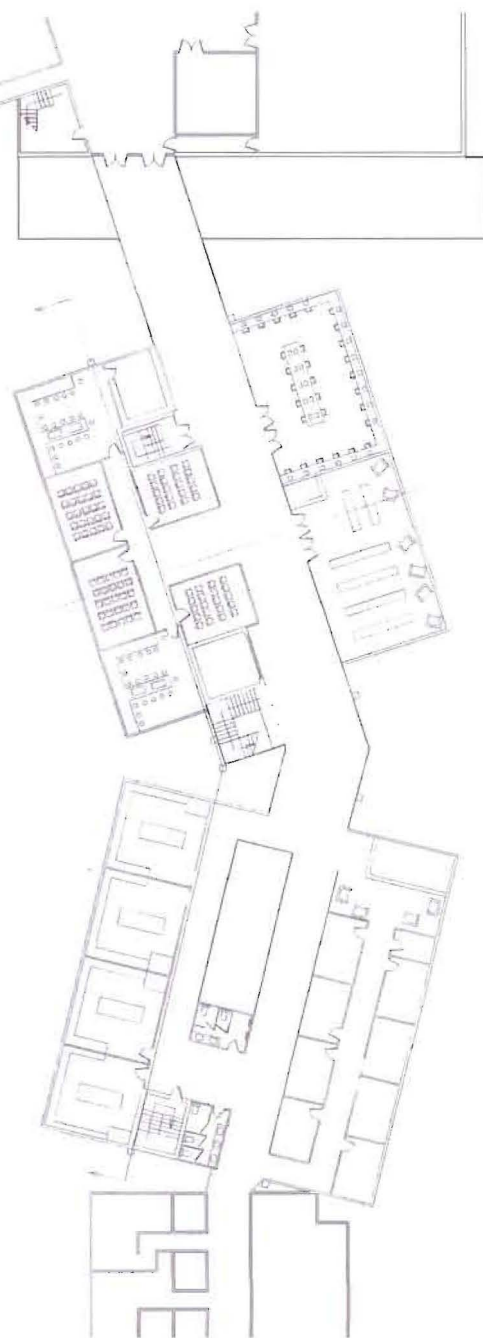
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3RD FLOOR VIEW INTO THE CIRCULATION ATRIUM --- D



INTERIOR VIEW INTO CIRCULATION ATRIUM --- C

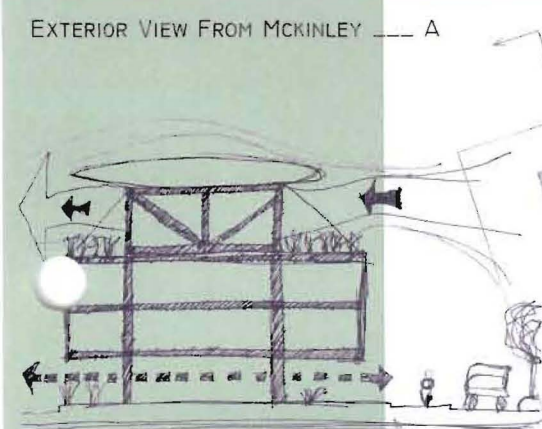


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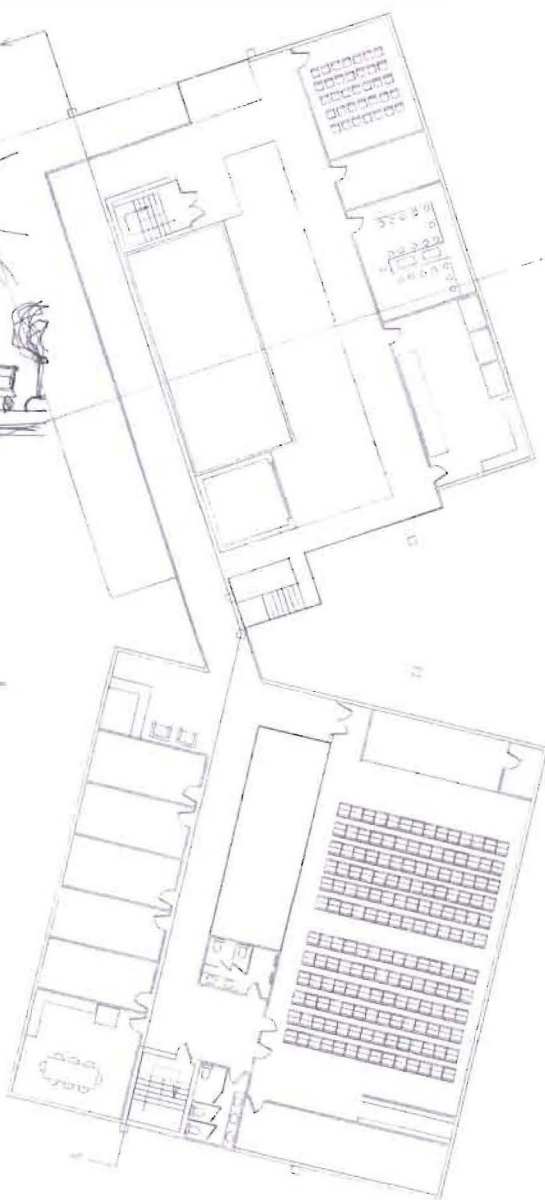
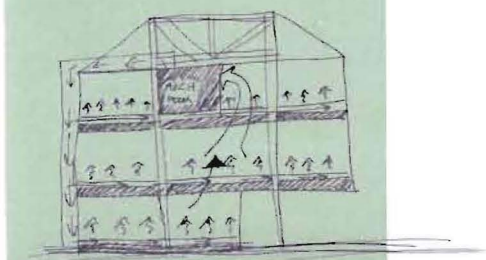
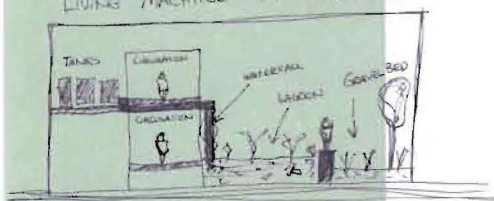
A DESIGN COMPETITION SPONSORED AND FUNDED BY CRIPE ARCHITECTS + ENGINEERS



EXTERIOR VIEW FROM MCKINLEY — A



LIVING MACHINE BREAKDOWN



WALL  
SECTION AND  
FACADE  
SWATCH

